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HPD PULSER UPGRADE TO IMPROVE RISETIME

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Presented to the
AMEREM
31 May 1996

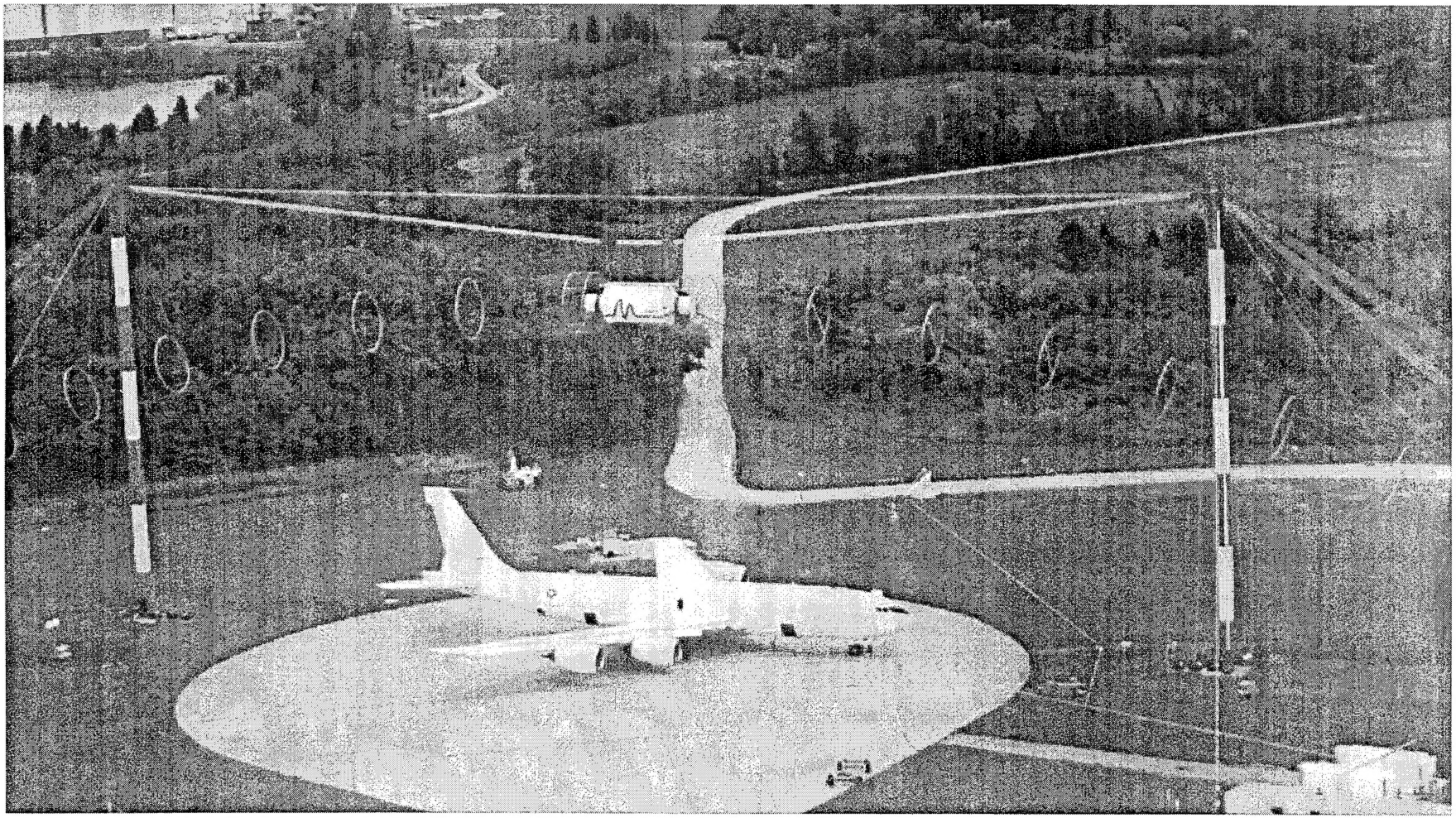
HORIZONTALLY POLARIZED DIPOLE FACILITY

NAWC
Aircraft Division
NAVAL AIR WARFARE CENTER

M.L.I.

UIE

L3 AND B ENTERPRISES



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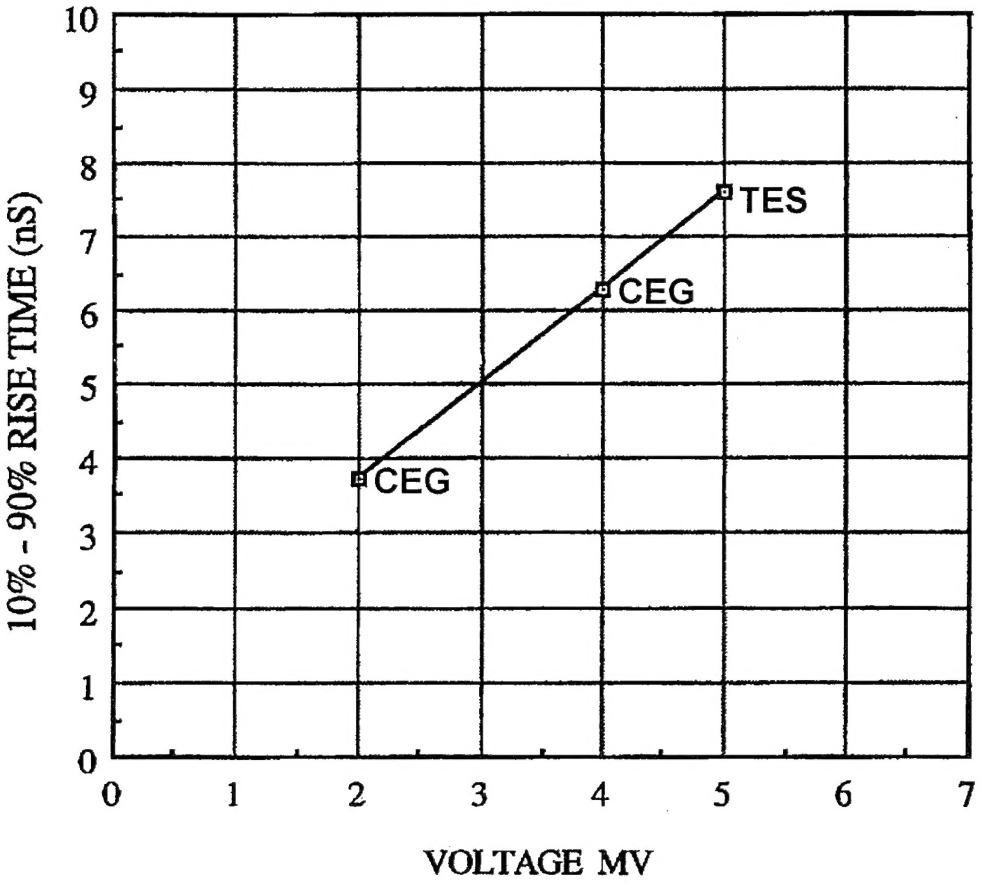
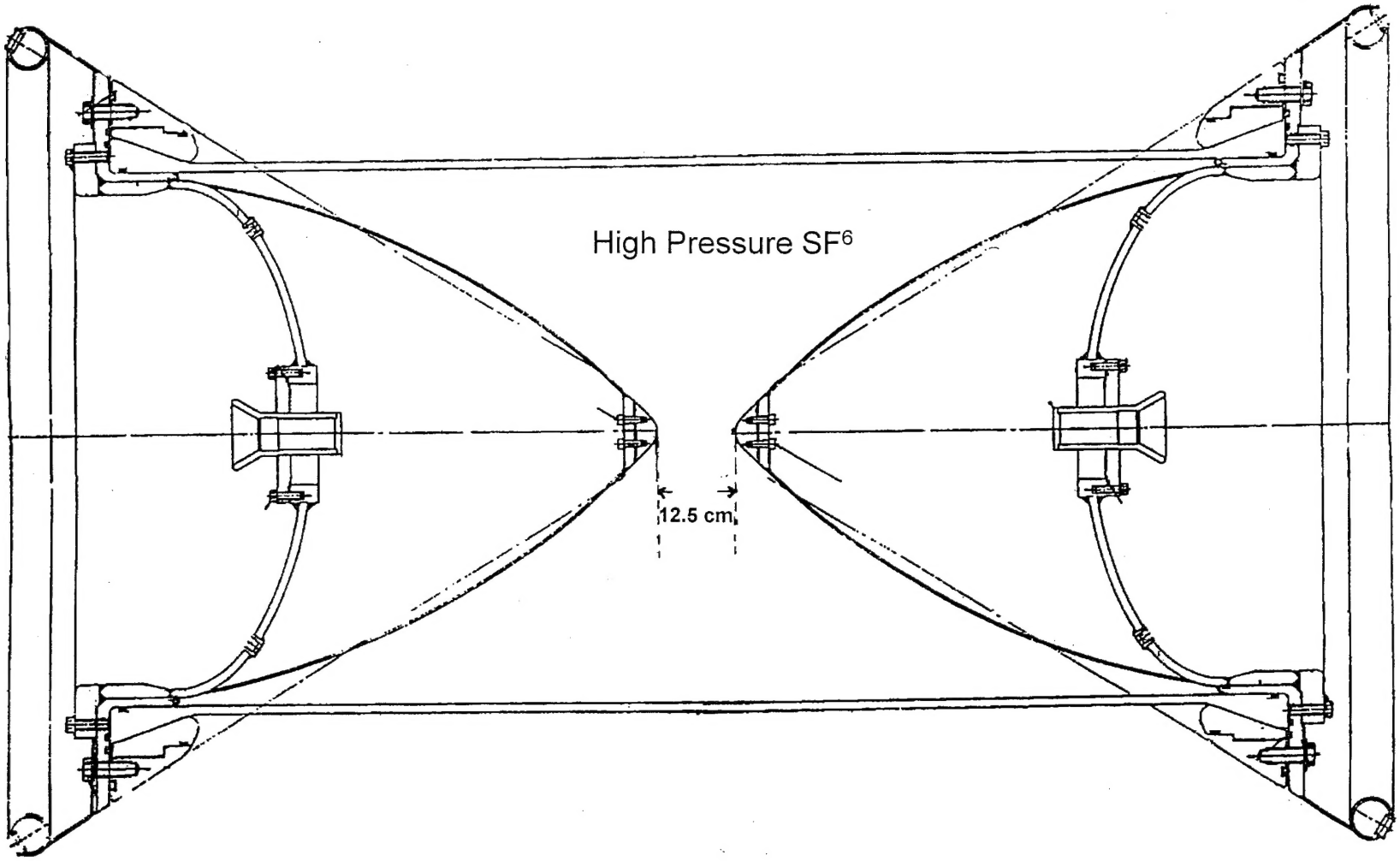
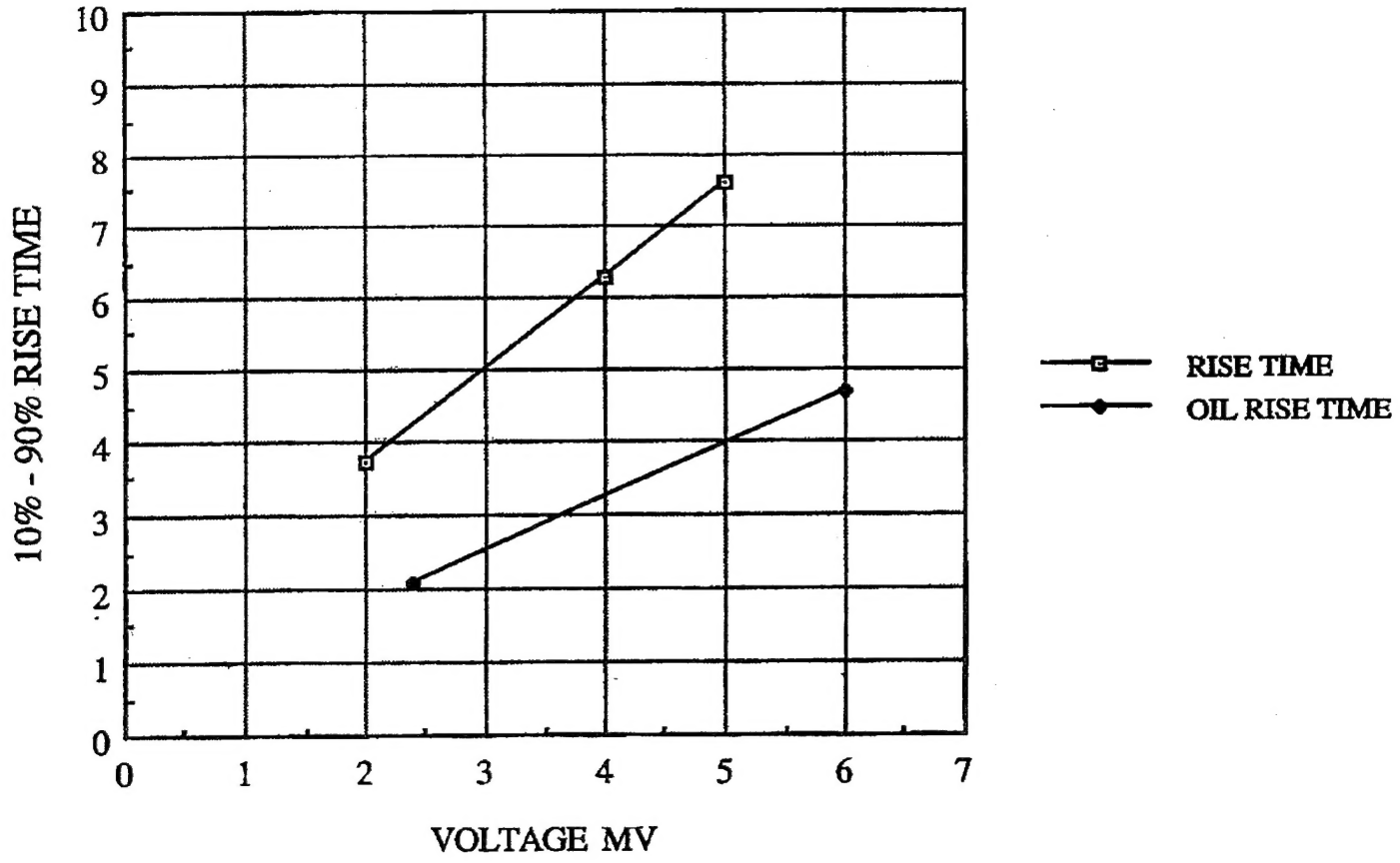
RISE TIME OF CONVENTIONAL SF_6 FILLED GAS SWITCH



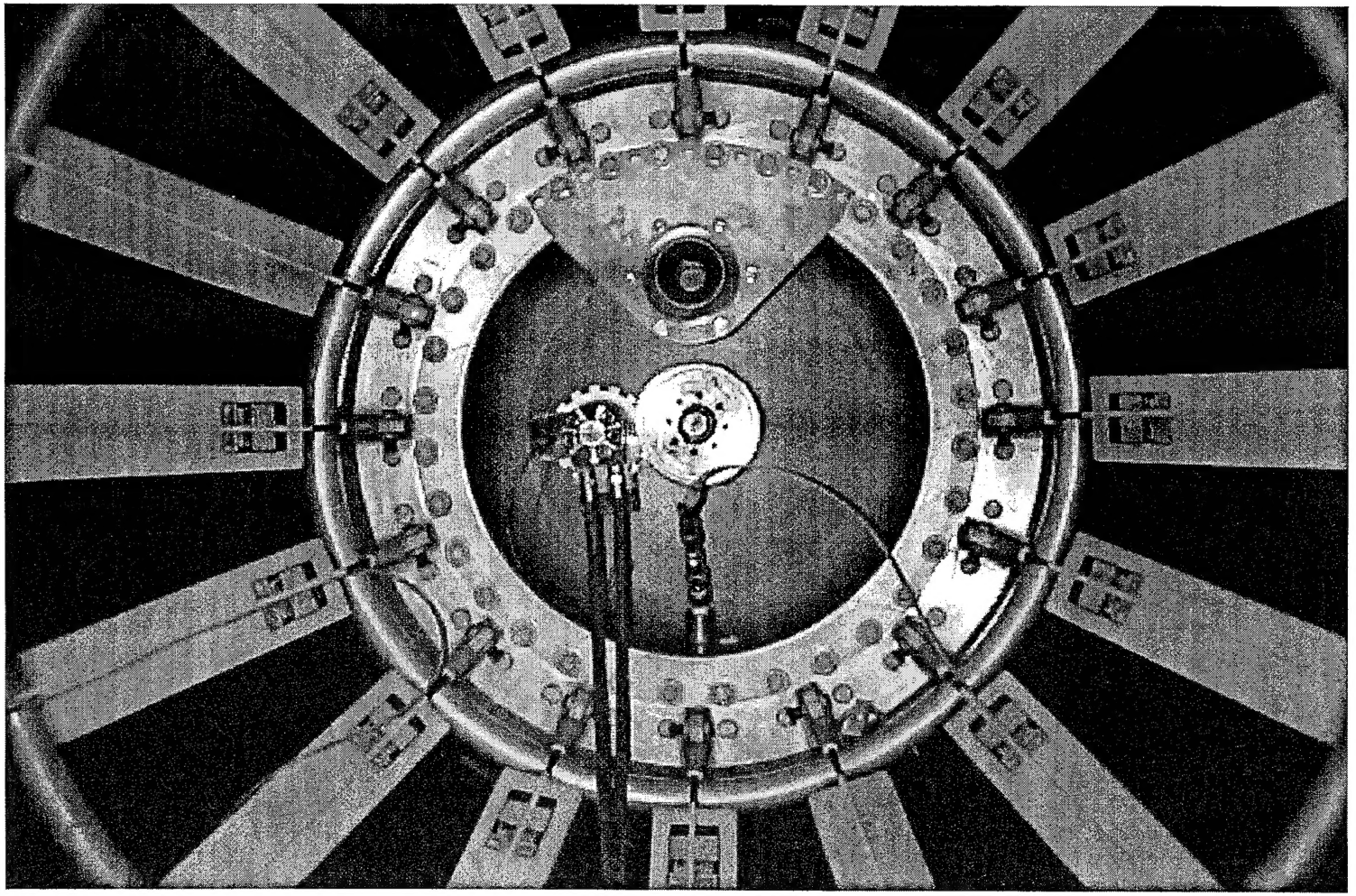
ORIGINAL SF_6 FILLED OUTPUT SWITCH



EXPECTED OIL SWITCH RISE TIME



GAP ADJUSTMENT



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MOVABLE ELECTRODE

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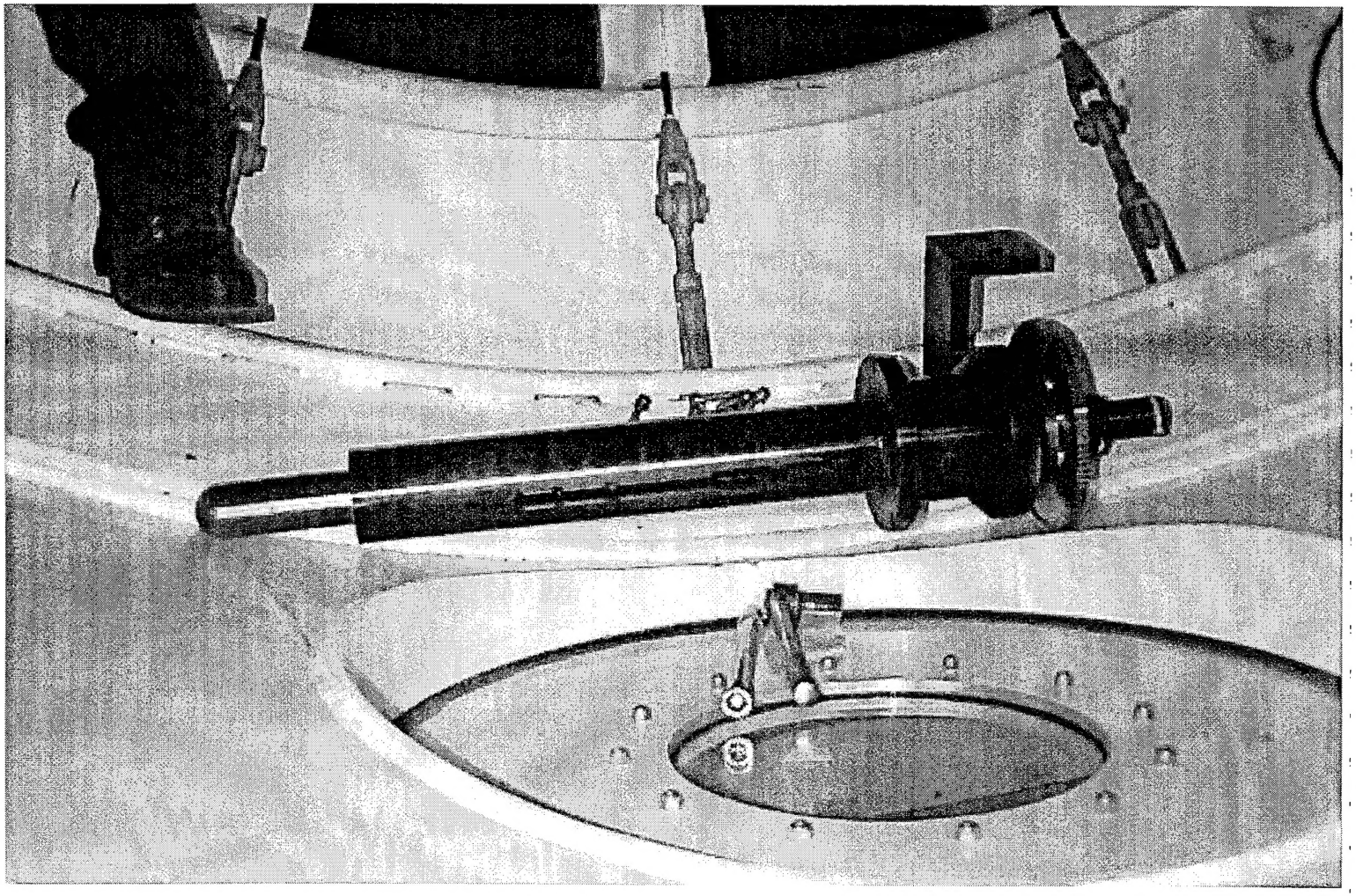
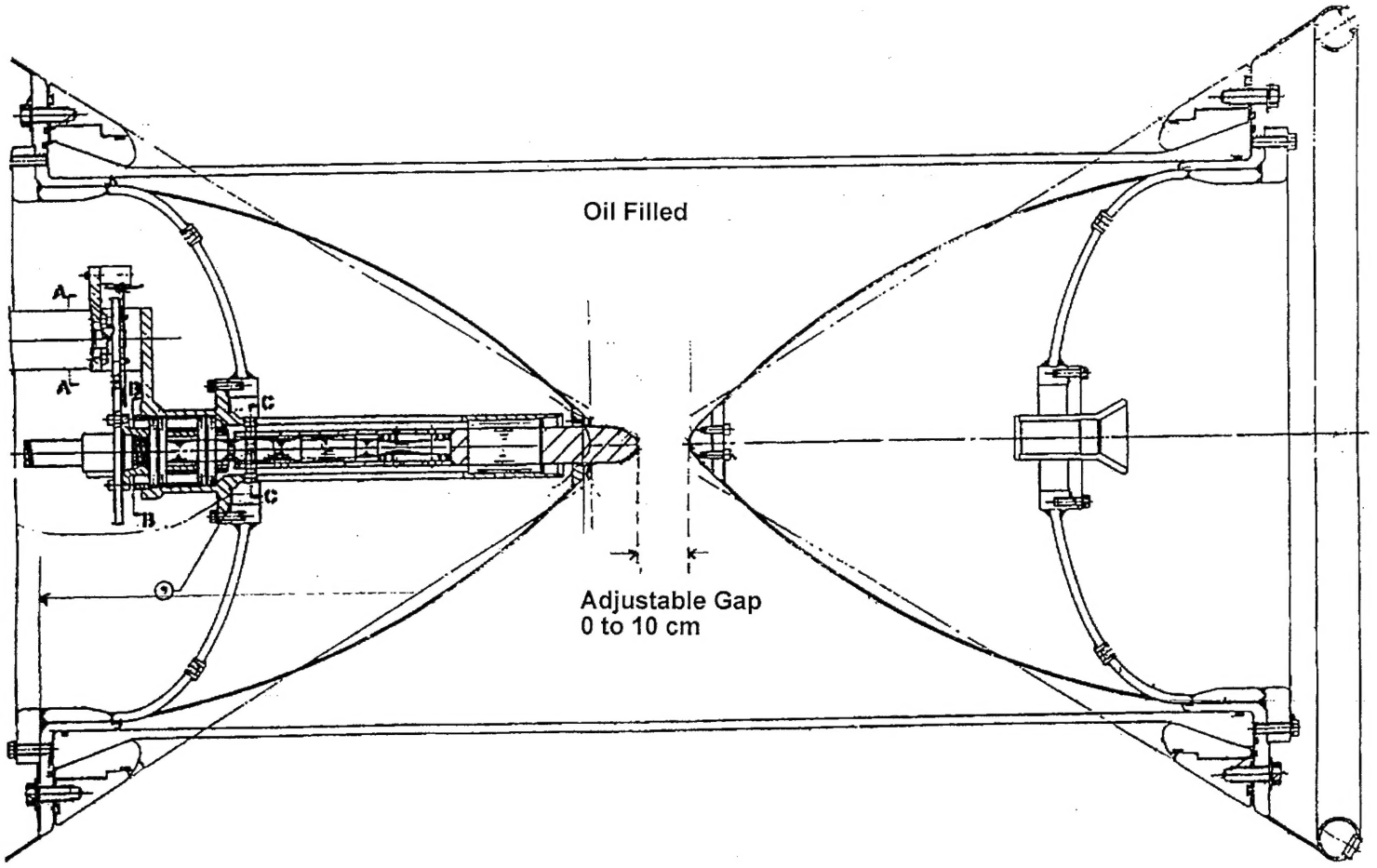
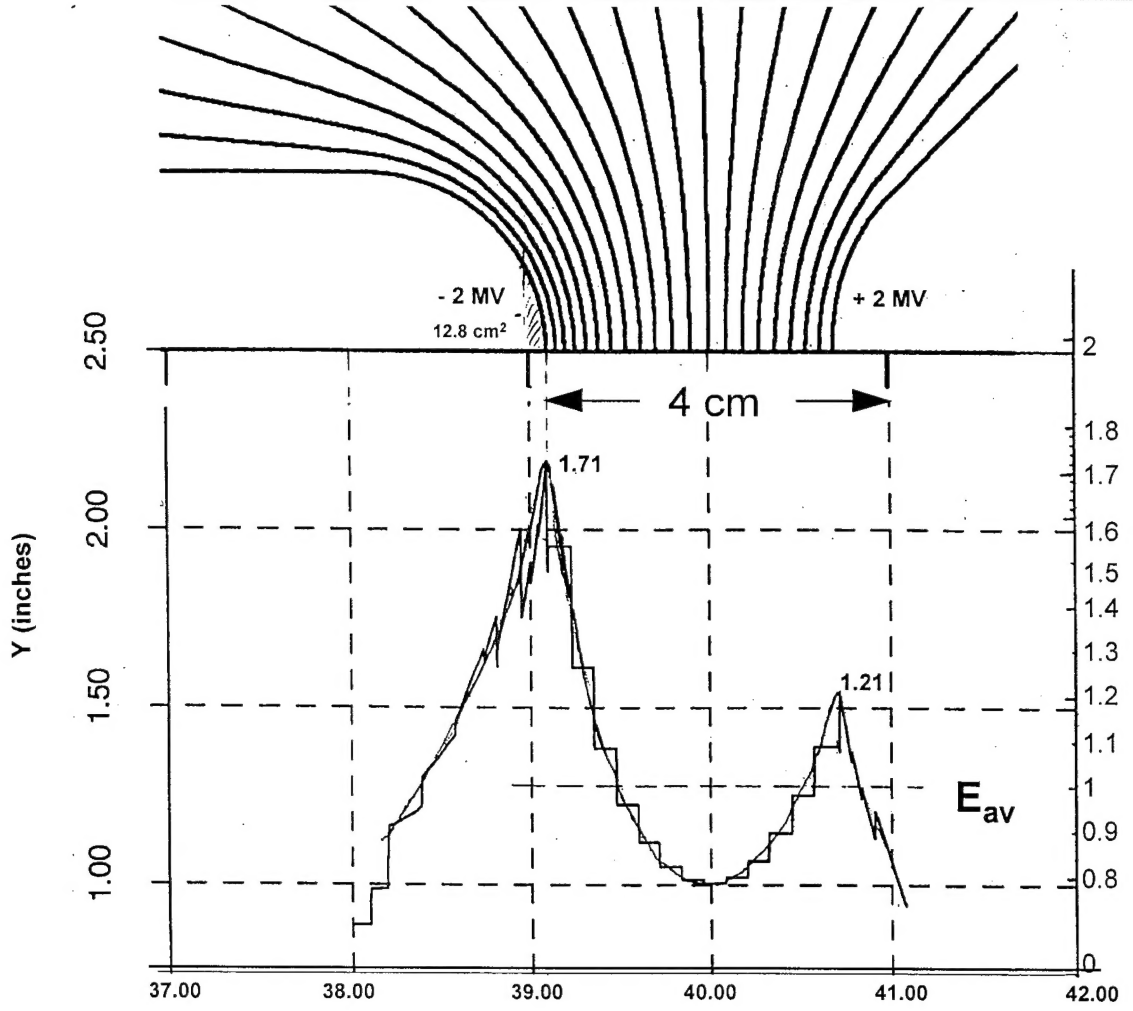
L AND B ENTERPRISES



OIL FILLED OUTPUT SWITCH

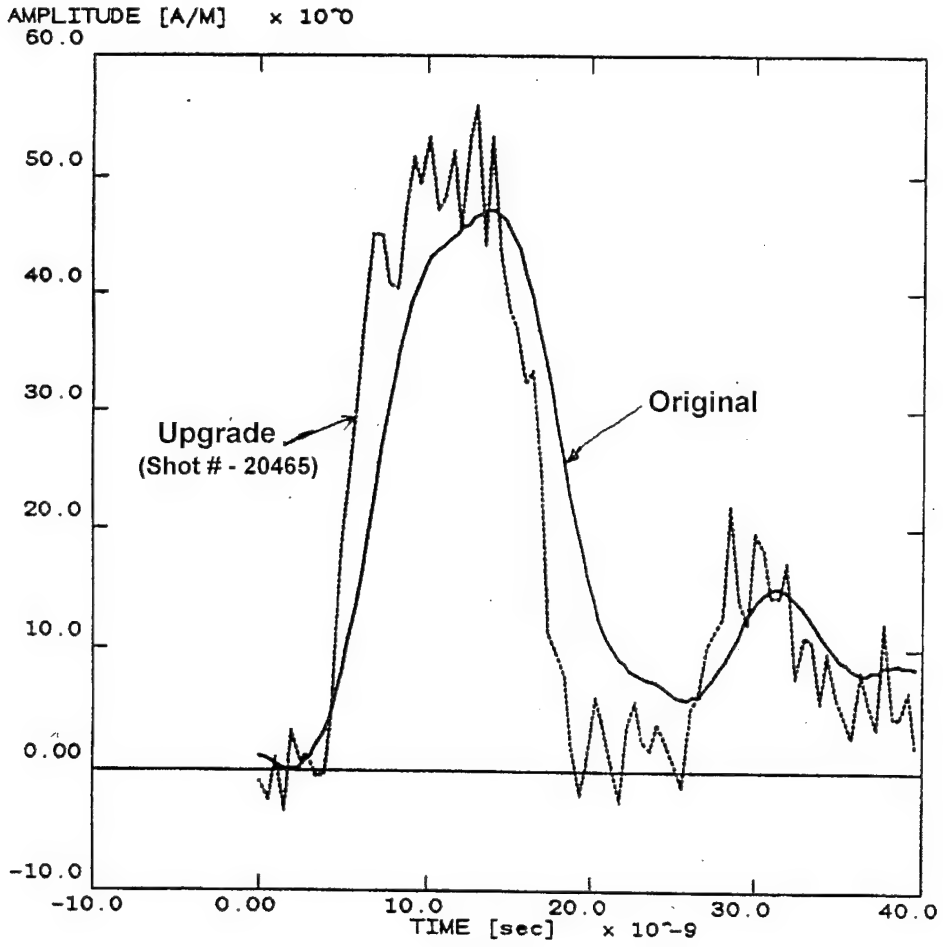


4 CM OIL GAP FIELD PLOT



E (x 10^6)
Volts/cm

PRELIMINARY FIELD MEASUREMENT DATA



Rise Time Improved
From 7.8 ns to 3.5 ns

FAST RISING PULSE OIL BREAKDOWN

Generally Accepted Fast Rising Positive Field Oil Breakdown

$$F_{BD}^{+} = \frac{0.49}{t_e^{1/3} \bullet A_e^{1/13.7}}$$

Substitute:

$t_e = 0.05\ \mu s$, $A_e = 5\ cm^2$

$$F_{BD}^{+} = 1.183\ MV/cm$$

TES Upgrade Oil Switch
V = 4 MV, Gap = 4.14 cm

Peak Field at Positive Electrode Tip = 1.178 MV/cm

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CONCLUSION

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1. The Goal of Improving TES Pulser Rise Time to Better Than 4 ns Has Been Achieved.

2. The Upgraded Oil Field Output Switch Can Now Deliver Better Than:

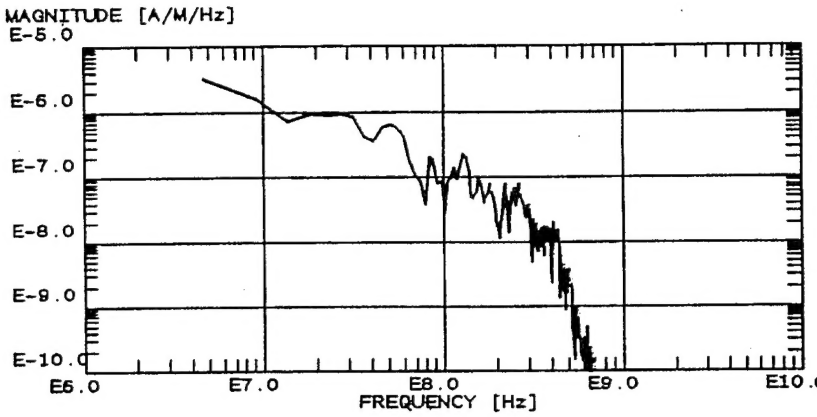
   1 ns/MV 10% - 90% Rise Time Pulse

3. Risetime Can Be Varied By Controlling Pulser Charge Voltage.

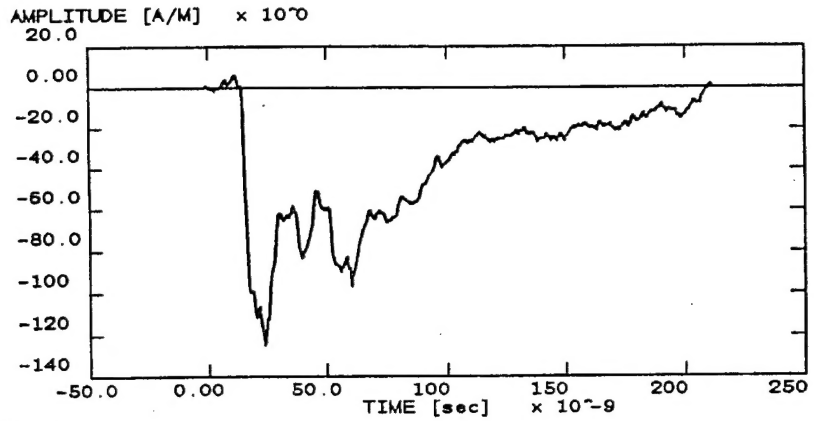
FIELD MEASUREMENTS

CORRECTED FIELD MAP DATA

7-MAY-96 10:15:05 FILE: DAS_DATA:ISCMGL2D_0023_02_1.RAW



Test ID	FIELD_MAP
Experiment Number	1
Pulse Number	20573
Pulse Date	17-APR-1996 14:39:50
Ref Field [kV/m]	0.0000
Rise Time [sec]	23.52 E-09
Measurement Type	HZ
Measurement Priority	A
Probe type	MGL-6
Probe Eu Conv. factor	1.260 E-09
Transmitter Gain [db]	-21
Total Scalar Gain [db]	-231
Peak [A/M]	-124.4
10%-70% Time [sec]	1.891 E-09
Signal/Noise Ratio [dB]	45
Projected RiseTime [sec]	2.521 E-09
Decay Time (1/e) [sec]	67.95 E-09



%E	Alpha	Beta		Delay
82.1	7.498 E+06	14.10 E+06		4.4E-08
%E	Freq (Hz)	Amplitude	Q	Delay
78.0	4.702 E+06	168.5	0.6	1.7E-07

FIELD MEASUREMENTS

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CORRECTED FIELD MAP DATA

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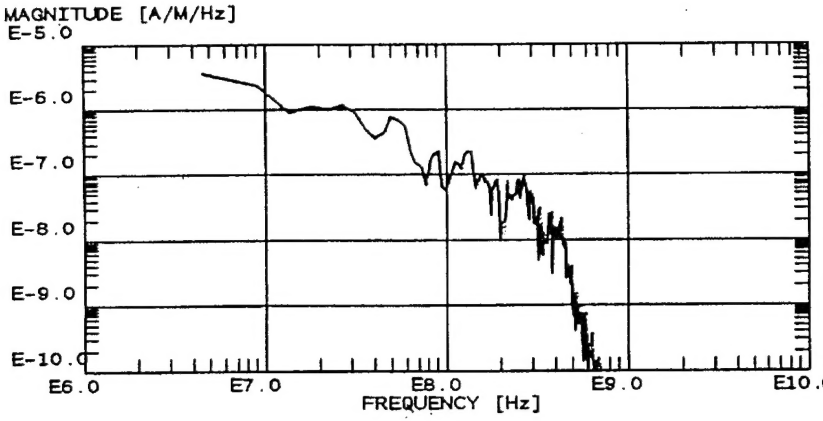
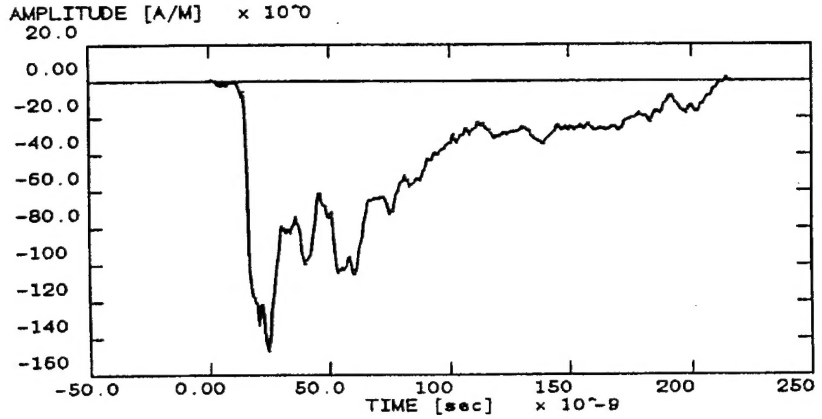


Test ID	FIELD_MAP
Experiment Number	1
Pulse Number	20574
Pulse Date	17-APR-1996 14:45:35
Ref Field [kV/m]	0.0000
Rise Time [sec]	32.86 E-09
Measurement Type	HZ
Measurement Priority	A
Probe type	MGL-6
Probe Eu Conv. factor	1.260 E-09
Transmitter Gain [db]	-21
Total Scalar Gain [db]	-231
Peak [A/M]	-146.7
10%-70% Time [sec]	1.928 E-09
Signal/Noise Ratio [dB]	42
Projected Rise Time [sec]	2.571 E-09
Decay Time (1/e) [sec]	62.51 E-09

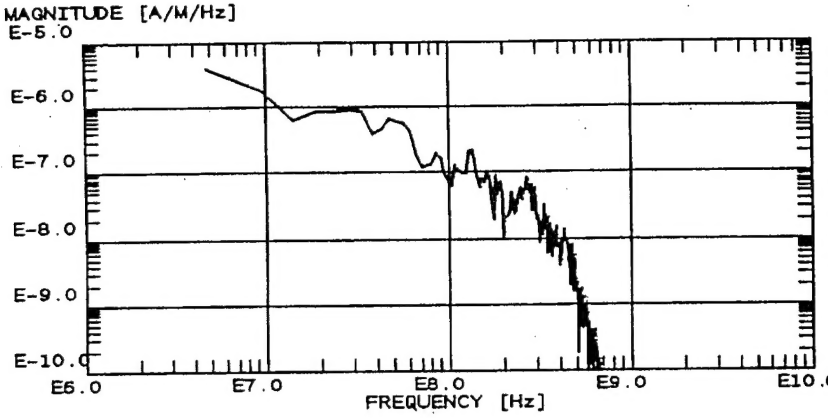


%E	Alpha	Beta		Delay
88.2	8.402 E+06	13.80 E+06		1.1E-08
%E	Freq (Hz)	Amplitude	Q	Delay
71.5	4.601 E+06	-140.0	0.8	5.7E-08

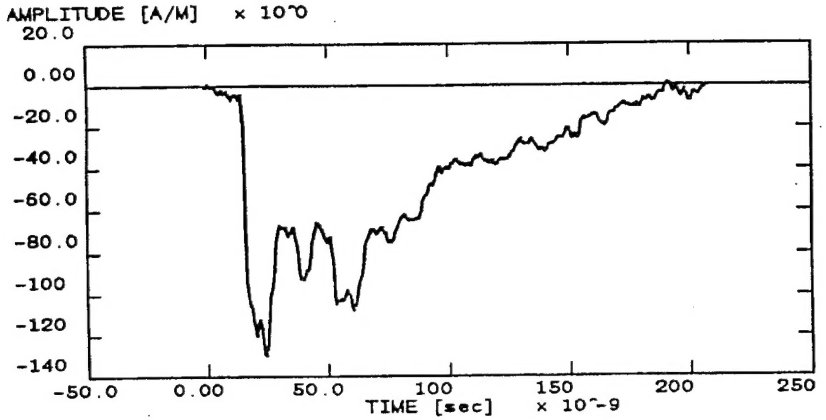
FIELD MEASUREMENTS

CORRECTED FIELD MAP DATA

7-MAY-96 10:17:44 FILE: DAS_DATA:ISCMGL2D_0025_02_1.RAW



Test ID	FIELD_MAP
Experiment Number	1
Pulse Number	20575
Pulse Date	17-APR-1996 14:58:51
Ref Field [kV/m]	0.0000
Rise Time [sec]	45.63 E-09
Measurement Type	HZ
Measurement Priority	A
Probe type	MGL-6
Probe Eu Conv. factor	1.260 E-09
Transmitter Gain [db]	-21
Total Scalar Gain [db]	-231
Peak [A/M]	-129.3
10% - 70% Time [sec]	1.923 E-09
Signal/Noise Ratio [dB]	40
Projected Rise Time [sec]	2.564 E-09
Decay Time (1/e) [sec]	70.17 E-09



%E	Alpha	Beta	Delay
100.8	7.449 E+06	14.46 E+06	4.3E-08